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UNIVERSITY OF SOUTHERN CALIFORNIA BULLETIN

LOS ANGELES, CALIFORNIA

VOLUME IX

JANUARY, 1915

NUMBER 6



THE VENICE
MARINE BIOLOGICAL STATION

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THE VENICE MARINE BIOLOGICAL STATION

PUBLISHED BI-MONTHLY BY THE UNIVERSITY
ENTERED AS SECOND CLASS MATTER UNDER ACT OF CONGRESS, JULY 16, 1894
LOS ANGELES, CALIFORNIA

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THE MARINE BIOLOGICAL STATION—
Venice, California.

SUMMER SESSION

The Summer Session of the College of Liberal Arts and the Venice Marine Biological Station will be held June 28th to August 9th, 1915.

The Liberal Arts courses will be given at the University, the Marine Station courses at Venice.

Special announcements of the courses may be obtained from the Registrar of the University.

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SAMUEL RITTENHOUSE, PH. D., *Associate Director.*

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FRANK W. YOCOM
Assistant Biological Survey

THE VENICE MARINE BIOLOGICAL STATION*

Previous reports have dealt with the problems of founding and equipping the Marine Station of the University. In this report is indicated a preliminary account of some of the results attained, referring particularly to the work of the past two years. The fragmentary character of the results is fully appreciated by the workers engaged in these investigations. Pioneering, however, in any enterprise seldom produces results which are, from the beginning, other than incomplete.

We have this satisfaction concerning the work in which we have been engaged: It has been most helpful to the biological work of the University by stimulating an intense interest in the study of problems relating to living things and it has afforded an opportunity for such study which could scarcely have been attained in any other way. These results alone would be ample compensation for the effort and means invested. In addition to this, however, we have some small contribution of first-hand knowledge to offer and have prepared the way for securing results of much greater value.

Most of the work has been done by those who were busily engaged in other pursuits. This has necessitated using the vacation periods of the college year chiefly for Marine Station work and the funds available did not warrant working full time then.

It would have been impossible to accomplish the results attained except for the fact that we were able to use the energy and enthusiastic devotion to a scientific goal found in the students and instructors of the University. This is particularly true with reference to operating and caring for the launch. No service was too severe or task too difficult for these volunteer sailors to undertake. The fact that the launch has sailed without mishap many times over the sea from Point Dume to Newport and out at sea to Catalina and San Clemente

*The matter here presented consists chiefly of extracts from reports of the Director of the Station to the Board of Trustees of the University.

islands and has visited San Diego, Santa Rosa, Santa Cruz, and Santa Barbara islands, speaks eloquently for the amateur seamanship of these men.

The list of men to whom credit is due for service on the launch is too long to publish here in full. The following have given special time and service to the work. The responsibility for carrying into execution the work of the Anton Dohrn has been borne by Percy S. Barnhart and J. Ross Beck during the period November, 1912, to June, 1914; since that time by Elmer Higgins and J. Ross Beck. Student assistants who have given considerable time and have rendered efficient service are: Walter Hepner, Henry Wheeler, Ervin Wahrenbrock, Mervin Oakes, Frank Yocom, Ernest Trevor and Allen Hobbs.

During the summer of 1914 a line of dredging and trawling has been completed which connects our present north west goal, viz., Point Dume with the work done off the coast at Long Beach. This affords a series of hauls at most points off the coast for a distance of about sixty miles. In addition we have made further explorations in the region about Catalina Island and the launch has been used in the work of the U. S. Fish Commission during an investigation of problems relating to the albacore industry. The list of sailings will be found elsewhere in this report.

The equipment of the station has been described in the Station Bulletins for November, 1910, and January, 1913. During the past year we have added a new general laboratory and office for the advanced students at the station. The laboratory has been equipped with the necessary apparatus for carrying on this work. The launch has been improved by the addition of numerous facilities which add to the comfort of the crew and efficiency of her work. The most useful equipment recently added was a centrifugal pump with suitable hose, two inches in diameter, for throwing a stream of water to any point on the deck. The pump is located in the engine room and is driven from the fly-wheel of the engine by a belt which is readily removed when a stream of water is not needed.

On long voyages there has been constant difficulty experienced in carrying living specimens in the tanks. This has happily been met by the use of the pump which provides a constant stream of pure water. The speed of the launch is not appreciably effected by this continuous use of the pump and the value to the living material is very great. The chief use of the pump, however, is found during dredging and trawling. The hauls containing specimens, mud and debris are placed on the series of screens. Here a careful application of the flowing stream of water separates the mud from the specimens in a very efficient manner. The nets can be freed from adhering specimens and mud, as well as the deck cleared after the process is completed.

THE BIOLOGICAL SURVEY

The field covered by the survey, except the Catalina region and shore collecting, is indicated by the Maps, Plates I, II, and III. The points at which the dredge was used are represented by the letter D and the trawl by T. The numeral following each indicates the number of the haul of the dredge or trawl respectively. The dredging and trawling was all done with the station launch, the Anton Dohrn. A description of the launch and its equipment was published in the Bulletin of the University for January, 1913.

One hundred six stations have been dredged and trawled and a series of shore collections made at points within each of the regions studied. Plankton collecting has received comparatively little attention. Two series comprising nineteen hauls have been made with a Nansen closing net in the deep water off Redondo Beach and another series of twenty-four hauls with surface nets at various points while dredging and trawling, making a total of forty-three hauls.

THE PHYSICAL FEATURES OF THE REGION COVERED BY THE SURVEY

At this time a mere outline of some of the physical characteristics of the region in which our work was done may serve to make more intelligible certain conditions attending

the survey. Our work has been extended over the region off the coast from Point Dume to Newport Bay, a distance of about sixty miles, and the region about Catalina Island. For convenience the conditions found in the regions adjacent to the coast line may be considered in three divisions:

1. The Santa Monica Bay region.
2. The region adjacent to the San Pedro hills.
3. The San Pedro Bay region.

The Santa Monica Bay region extends from Point Dume on the northwest to Rocky Point on the southwest, a distance of about thirty-six nautical miles. The twenty-five fathom line is found less than one-fourth mile from shore at Point Dume. At Long Wharf, Santa Monica and Venice it extends out about three and one-half miles, then gradually approaches the shore at Redondo Beach, where it is again less than one-fourth mile from shore. South of Redondo the twenty-five fathom line makes an abrupt bend outward from the shore and continues to a point opposite Rocky Point at a distance of about one mile. The fifty fathom line extends approximately parallel to that of twenty-five fathoms to a point opposite Playa del Rey, where it is found about five and a half miles off shore. At this point it curves outward, reaching a distance of about ten miles opposite Manhattan Beach, where it bends shoreward, extending almost at right angles to the shore until it reaches a point about one-half mile off Redondo Beach, whence it recedes from the shore to a distance of about three and a half miles off Rocky Point.

Two very prominent features of the bay region which are shown by these soundings are (1) A broad sea bench about five miles long and four miles wide at its base extends out from the fifty fathom line off Manhattan Beach. (2) A deep submarine canyon opposite Redondo Beach brings the one hundred fathom line within one and a half miles of the shore. At the head of this canyon oil springs produce a marked oily condition on the surface of the water. At times the winds and tides spread this oil over an extensive area.

The coast from Point Dume to Santa Monica consists of abrupt bluffs varying from one hundred to three hundred feet,

back of which rise rugged rocky hills one thousand feet in height. In this region the kelps are found close to the shore. The coast from Santa Monica to Playa del Rey consists of a flat rather level sandy beach. Extensive tide flats are found at Venice and Playa del Rey. Rising from the beach from Playa del Rey to Redondo Beach are found extensive sand dunes at places reaching a height of two hundred feet. Approaching Rocky Point the cliffs rise rather abruptly from the rocky beach to about two hundred feet in height.

2. The San Pedro Hills region extends from Rocky Point on the west to Point Fermin on the east, a distance of about eleven nautical miles. The coast here is very rugged, consisting of a series of headlands rising abruptly two hundred feet and separated by open coves with narrow sandy beaches. Six prominent points project into the sea from this region, viz., Rocky Point, Point Vincente, Long Point, Portuguese Point, White's Point, and Point Fermin. The kelps abound on this coast, extending out to the ten fathom line at most points about a half mile from shore. At Portuguese Point the kelps are very close to shore but at Rocky Point they extend out three-fourths of a mile to the twenty fathom line.

The twenty-five fathom line is found about three-fourths of a mile from shore at Rocky Point thence it approaches the shore, at Long Point being less than one-fourth mile out. Off Portuguese Point the twenty-five fathom line is about three-fourths mile from shore. Thence it gradually recedes to a distance of about one and a fourth miles at Point Fermin.

The fifty fathom line is found about three-fourths mile from shore at Long Point, thence extends out gradually to a point about two miles off shore at Point Fermin. The sea floor drops off very abruptly from the fifty fathom line off this entire region. At Portuguese Point a depth of two hundred twenty fathoms is reached two miles off shore and three hundred fifty fathoms at three miles.

3. The San Pedro Bay region extends from Point Fermin to Newport Bay, a distance of about twenty-seven miles. The coast here consists almost wholly of low sandy beach. Inlets of the sea have formed extensive tide flats at San Pedro, Alamitos Bay and Anaheim Landing.

The twenty-five fathom line is found about one-fourth mile from shore at Point Fermin. It extends out two and a half miles off Long Beach, then gradually approaches the shore to a point near Newport Bay, where it is one mile out. Here an abrupt curve brings the twenty-five fathom depth within one-fourth mile of Newport Beach, whence it again recedes to a point about three-fourths mile and extends some distance nearly parallel to the shore.

The fifty fathom line is found about twelve miles south of Long Beach, and bends sharply shoreward, at Newport Bay approaching within a mile of the coast. Thence it curves out and parallels the coast at a distance of about one and a half miles.

In the San Pedro Bay region the shallow water extends out about twice as far as that of Santa Monica Bay. The deep water approaching Newport Beach is roughly comparable to that at Redondo Beach; the one hundred fathom depth is considerably farther from shore at Newport Beach.

METHODS EMPLOYED IN THE SURVEY

In the work done prior to this date it has not been feasible to secure complete hydrographic data concerning each of the stations studied. We have made some observations as to depth, temperatures, condition of bottom, currents, etc., and in each case a record was made of this data. With the facilities at hand, however, we have not felt that we could profitably attempt systematic hydrographic work of a sufficient degree of accuracy to make it worth the effort expended. We have depended largely upon the data found in the government surveys to guide us in our work.

During the following year the departments of Physics and Chemistry of the University may be able to provide the necessary workers and equipment to begin accurate hydrographic investigations at each station.

The location of the stations at which hauls were made in some of the earlier work was determined by the use of the compass and the running time of the launch at full speed. This was early supplemented by the use of the log. For

BOTTOM CONDITIONS

The following table shows fairly representative bottom conditions found in these regions:

	10 Fathoms	25 Fathoms	50 Fathoms
Santa Monica Bay region			
Point Dume	Light gray sand.	Fine gray sand (32). Green mud.	
Santa Monica	Fine gray sand (8).	Fine gray sand (26). Green mud (19).	Fine gray sand (55). Green mud.
Venice	Fine light gray sand.	Rocky (20).	Green mud (34). Sand, gravel.
Redondo Beach	Coarse gray sand and Green mud (9).	Oil (30), (50).	Fine light gray sand (69).
Rocky Point	Fine gray sand (7½).	Fine gravel (22).	Sand, green mud (44).
San Pedro Hills region			
Point Vincente	Dark gray sand. Broken shale.		
Long Point		Fine gray sand (31).	
Portuguese Point	Gray sand (15).		Gray sand and mud.
White's Point	Gray sand.	Blue mud.	Fine gray sand and mud (70)
Point Fermin	Gray sand.	Fine gray sand (22).	Fine gray sand and mud (75)
San Pedro Bay region			
Long Beach	Fine gray sand.	Fine gray sand (21).	
Huntington Beach	Sand and mud.	Dark gray sand (18).	
Newport Beach	Fine gray sand.	Fine gray sand (30).	Brown mud (130).

*The record is taken from the nearest depth and locality at which a sounding is recorded. Numbers in parentheses indicate depths in fathoms.

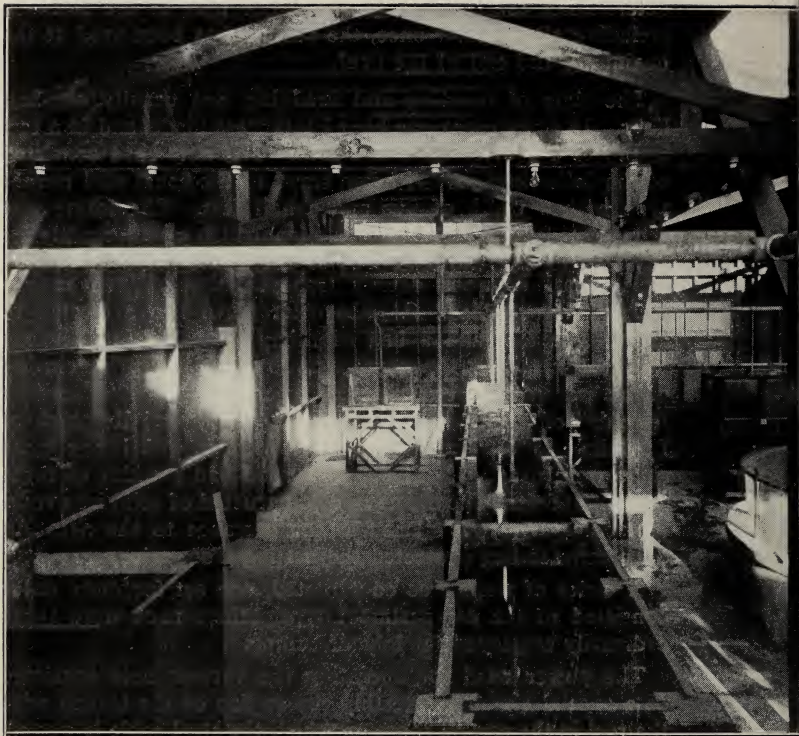
determining the location of the major part of the stations, including all the later ones, the sextant has been used at the beginning and end of the haul.

The time of trawling and dredging was usually one-half hour. In some cases one hour hauls were made, and in a few instances a shorter time was used. The nets used consisted of the following: 1. A beam trawl of the usual sled runner type with a width of five and a half feet. The frame was constructed of galvanized gas pipe which could readily be adjusted to any width desired or the frame could be packed in a small compass during transportation. When in use weights were added. 2. The otter trawl had a stretch of twenty-five feet and a bag of thirty feet. 3. The Nansen plankton net with the usual No. 20 mesh cloth. A closing device was constructed after the type used on the "Alexander Agassiz" of the Scripps Institute for Biological Research at La Jolla. 4. Several surface plankton nets with heavy brass rings were used. 5. The dredge used had a width of three and a half feet. The frame was constructed of solid iron rods. A cutting edge was placed at the entrance to the net. An open canvass bag protected the netting from injury.

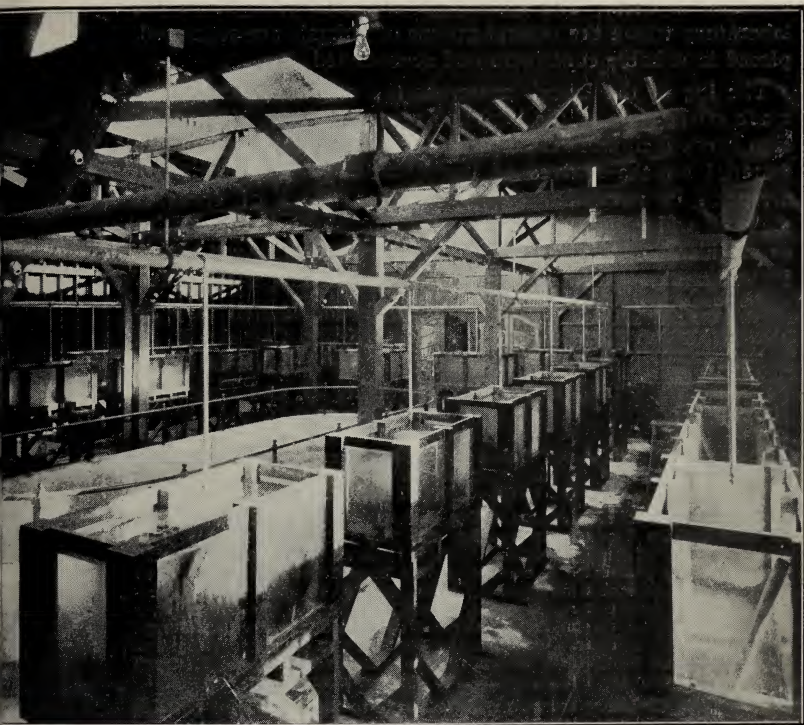
A series of traps was constructed, one set for deep water consisted of the compartment type, others used were those ordinarily employed for lobster fishing.

The power used for operating the various nets consisted of a special clutch connecting the engine of the launch with the reel in the engine room on which the steel cable is wound. By means of sheaves the cable is carried out through a port hole, to the boom, thence to the net.

In the use of the trawl or dredge the haul is emptied on a series of screen cradles on deck, the stream of water from the pump is played over the material in such a manner as to aid in separating the mud from the animals and plants present. The catch is placed in suitable containers and appropriate labels added. In the case of animals with calcareous shells or others specially injured by formalin, eighty per cent alcohol is used as a preservative. In the case of some of the larger animals or those not seriously injured by it, ten per cent



THE AQUARIUM consists of forty glass tanks for the storage tanks by an electric motor. In the (indicated by the iron railing) twenty-six by lions. The Aquarium is open to the general public



with constantly running sea water pumped into large
ter of the Aquarium is found an oval concrete pool
elve feet, and ten feet deep, containing a pair of sea
y from nine o'clock a.m. to nine o'clock p.m.

formalin is used. The collections are then brought to the laboratory where the several groups of animals are separated, placed in suitable containers and accessioned.

The log of the launch preserves the original observations made at the time of the haul and recorded then. The accession cards facilitate reference to the data of the log and the material on the shelves of the laboratory. The cards are arranged in numerical order. Another series of cards is made on which the name and museum number of such species as are identified are placed. The genera are arranged alphabetically. A museum record is arranged in numerical order.

Some idea of the routine work with the launch may be obtained from the following extracts from Captain P. S. Barnhart's report on the operations of the Anton Dohrn for 1912-1913. The trips were made November 29, and December 26, 1912.

The work with the Anton Dohrn for the year was begun on November 29, 1912, during the Thanksgiving recess. At this time trawling was carried on off Point Fermin and dredging off White's Point.

Three and half miles southeast of San Pedro Light the sea bottom shelves off sharply from fifty to one hundred and fifty fathoms, making a slope about a quarter of a mile in width. On this bank we have found the animal life to be very plentiful. A trawl of a half hour duration (see Trawl 6) brought up 300 starfish representing three species, 48 sea-urchins, 4 sea-cucumbers, 12 brittle-stars, 82 crabs, 11 mollusks, and a variety of lower forms. At another season the trawl came up loaded down with the eggs of a cephalopod mollusk. Although the weather was dark and rainy and the ground swell rather high, we managed to make five hauls with the trawl and six hauls with the dredge, in the two days we were out.

During the Christmas recess a trip was made to the Isthmus of Catalina Island. This trip was planned with two purposes in view. First to make a preliminary survey of the water and shore lines on both sides of the Isthmus; second, to gather living specimens for the Aquarium.

We left San Pedro about noon of December 26 with a crew of four, P. S. Barnhart, H. H. Wheeler, J. Ross Beck, and LeRoy Barnhart. The run was made to Venice for our supplies and after taking them aboard the course was taken for Catalina Harbor on the south side of the Isthmus, which point we reached at five o'clock the next morning, December 27. This continuous run of over twenty hours was rather severe on the crew, however after sleeping for several hours and eating a hearty breakfast, we felt in first class condition and proceeded to get the traps in order and collecting apparatus together. In the afternoon the traps were taken to Little Harbor and set just outside the kelp line. Barnhart and Beck went ashore and made collections from the tide line. It was after dark when anchorage was again made in Catalina Harbor.

The next morning, December 28, only one specimen was found in the traps. This was a large "swell shark" (*Catulus uter*). Fishing was carried

on at the entrance to the harbor, with hand lines, without success. At 4 p. m. all hands went ashore for low tide collecting, two taking the east shore and the other two the west.

The west shore near the entrance to the harbor is very rocky but well protected from the direct action of the waves. The tide rocks are covered with dense growths of sea weeds, while beneath them animal life is abundant. At the high tide mark where the rocks are somewhat bare, black abalones are plentiful. Beneath the rocks crustaceans and worms predominate. Littorinid gastropods are abundant everywhere, especially so on the rocks of this shore. In an hour's time several jars of specimens had been collected and as it was then growing dark, we went aboard the Anton Dohrn and ran into the harbor. After dark a lantern was lowered over the side of the launch to the surface of the water. Several Portunids, swimming crabs, attracted by the light, swam up and clung to the side of the boat and were taken with hand nets.

December 29 was bright and clear and the water was very calm. Barnhart and Beck spent the morning rowing around the harbor, investigating the several coves, making observations with the aid of a hand water-glass. Sea-hares and sea-cucumbers are scattered over the sandy bottom of the coves, while the "marine gardens" among the tide rocks and in the rocky depths along both shores near the entrance to the harbor, are not to be surpassed in beauty by any other "gardens" around the island. Damsel, wrasse, and parrot-fishes with their brilliant colors, swim about the rocks and among the beautiful sea-weeds, while here and there sea-cucumbers, abalones, giant key-hole limpets, and sea-hares, cling to the sides of the rocks. The afternoon of the 29th all hands went across the Isthmus to Isthmus Harbor. Some of the party fished from the end of the pier, and others circled the shore for low tide collections. Fishes and littoral forms seemed to be very scarce. A lower tide would give much better results in shore collecting.

December 30th a quantity of sea-cucumbers and sea-hares were killed and preserved for future use of laboratory students. The trawling apparatus was then put together and three hauls taken, one at the entrance to the harbor in twenty-seven fathoms, one running due south to forty-three fathoms, and one west by south in forty-three fathoms. The first two yielded an assortment of echinoderms, crabs, mollusks, and small fishes. In the last haul the trawl caught on the bottom just as it was being hauled in, broke loose and pulled up backward. The only specimens left when it reached the surface was a bunch of Molluscoida or "lamp-shells." The wind and swell were so high by this time that it was impossible to work. The cable was taken in and oiled and at 3:30 p. m. we started for Isthmus Harbor on the north side of the island at which place anchorage was made at 5:30 p. m. After dark hand lines were used from the side of the launch and eighteen rock sculpins were caught in less than one hour.

Early the next morning, December 31st, we ran up to a small cove where the traps had been set the evening before, and took them up. In one was found a large "swell-shark" and in the other a medium sized lobster. Fishing was carried on until two o'clock in the afternoon but only one large whiting was taken. Schools of Chromids could be seen swimming around the launch but these little fishes will not take a hook with ordinary bait. Later on a run was made to Bird Rock at which place several plankton hauls were made and we then ran back to the harbor anchorage. After dark hand lines were again used and eighty-one rock sculpins caught. This

seemed a peculiar thing, for the Anton Dohrn was anchored over a smooth, sandy bottom in about thirty feet of clear water and during the day no fish were seen anywhere near the launch. The sculpins may have been attracted by the lights of the boat or were out in a nightly search for food.

New Year's morning anchorage was made a short distance west of Isthmus Harbor and while three of the crew were ashore collecting abalones, Barnhart took a number of plankton hauls and collected several species of floating ascidians. In the afternoon the six-foot trawl was put together and three hauls made in the main channel of the west entrance. These were not very successful as the current was swift owing to the incoming tide and kept the trawl off the bottom. The last haul the trawl caught and came up with the frame broken. At 9:35 p. m. we left Isthmus Harbor and arrived off Venice at 4:30 a. m., January 2nd. The ground swell was very high and it was impossible to make the landing, so we had to tie up at the mooring. After waiting until 3 o'clock in the hope that the swells would abate somewhat, we finally ran down to Santa Monica Pier and landed two of the crew who immediately went to Venice and rigged up block and tackle for the small skiff. After landing these two, the launch was run back to its mooring off Venice and then P. S. and LeRoy Barnhart went ashore in the skiff, running the breakers at the end of the break-water without mishap.

The next morning, January 3, Barnhart and Beck went out to the Anton Dohrn and brought ashore the live abalones and other specimens.

It will be apparent that this more or less mechanical part of the work has been time consuming. It is equally evident that the value of any results to be attained will depend very largely upon the painstaking accuracy of this initial work. A large part of the time we have been able to give to the station work has been devoted to equipping for the survey; operating the launch and caring for it; preserving the material and making suitable records. It was deemed expedient to continue this feature of the work until we had in a general way covered the regions we had planned to explore.

The identification of most of the species of animals and plants in our collections remains yet to be made. In some groups such as the fishes, and some others, a preliminary list is well under way, and other groups are in the hands of specialists for identification. This work will again require time for completion.

Supplementing the offshore work of the launch a somewhat detailed study of certain limited areas of the shore fauna has been undertaken by graduate students of the University. These localities at present are at Venice, Point Fermin, and Newport Bay.

TRIPS OF THE ANTON DOHRN*

September, 1912, to September, 1914

- 24—November 29-30, 1912. Trawling and dredging off San Pedro, Point Fermin, and White's Point.
- 25—December 26, 1912, to January 2, 1913. Expedition to Catalina Island. Trawling, dredging, and general collecting carried on at and around the Isthmus.
- 26—January 15, 1913. Venice to Long Wharf to protect from southeast storm.
- 27—January 18, 1913. Long wharf to Venice mooring.
- 28—January 19, 1913. Venice to San Pedro to put launch in care of L. A. Motor Boat Club for the winter.
- 29—February 8, 1913. Faculty trip round San Pedro Harbor.
- 30—February 14-16, 1913. To boat yards to paint and clean.
- 31—February 21-22, 1913. Collecting trip around the government breakwater, San Pedro.
- 32—March 29 to April 4, 1913. Trawling, dredging, plankton and general collecting from Alamitos Bay to White's Point.
- 33—April 12, 1913. Trial run to Outer Harbor and back.
- 34—April 26, 1913. Zoology class demonstration trip.
- 35—May 11, 1913. Opening day of the L. A. Motor Boat Club. Inspection of launch by U. S. Government officials.
- 36—May 30, 1913. Major students in Biology out for demonstration trip.
- 37—June 10-19, 1913. San Pedro to Catalina Island via Venice. General collecting and plankton work.
- 38—July 17, 1913. San Pedro to Anaheim Landing and return. After *Urolophus halleri*.
- 39—July 18, 1913. San Pedro to Venice. To carry on scientific work at Hyperion and prepare for general summer's work in Santa Monica Bay.
- 40—July 26, 1913. Venice to Hyperion and return. Scientific work at outfall sewer. Demonstration trip for Prof. Life and class in Marine Botany.

*The sailings prior to September, 1912, are recorded in Vol. 7, No. 6, of the Bulletin of the University.

- 41—July 29, 1913. Trawling off Venice.
- 42—August 2, 1913. Trawling off Venice. Summer school students on board.
- 43—August 7, 1913. Trawling off Venice.
- 44—August 8, 1913. Trawling off Venice.
- 45—August 14, 1913. To trawl in the bay and to follow large school of fishes.
- 46—August 15, 1913. Venice to San Pedro. For fuel and to get a new working boom.
- 47—August 18-22, 1913. San Pedro to Catalina Island via Venice. Collecting trip for the Aquarium. Trawling and collecting around Avalon Bay and the Isthmus.
- 48—August 22, 1913. Venice to San Pedro. To paint, repair and lay by for the season.
- 49—November 25, 26, 1913. San Pedro to Venice and return. Preparation for Catalina trip.
- 50—November 27-30, 1913. San Pedro to Catalina Island, chiefly shore collecting at Isthmus Cove.
- 51—December 26, 1913. Out from San Pedro trawling off White's Point.
- 52—December 27, 1913. San Pedro to Portuguese Bend. Trawling expedition.
- 53—March 14, 1914. Trawling off Point Fermin.
- 54—June 19, 20, 1914. Trawling outside of San Pedro Breakwater.
- 55—June 22-26, 1914. Trawling and dredging near Portuguese Bend.
- 56—July 8-8, 1914. L. A. M. B. C., Wilmington to Venice for use of Marine Station during summer session.
- 57—July 10, 1914. Trip with summer school students from Marine Biological Station to Long Wharf collecting in skiff from piles and dredging off Malibou Cove.
- 58—July 11, 1914. Dredging off Santa Monica Municipal Pier.
- 59—July 25, 1914. Dredging off Point Dume.
- 60—August 1, 1914. Dredging off Long Wharf.
- 61—August 8, 1914. Dredging between Long Wharf and Venice.
- 62—August 11-13, 1914. Dredging and trawling between Venice and Rocky Point.

The following trips were made in the interest of the U. S. Fish Commission work. The special investigation was conducted by Percy S. Barnhart assisted by J. Ross Beck.

- 63—June 30, 1914. San Pedro to Santa Monica Bay and return.
- 64—July 2, 1914. San Pedro to Catalina Island and return on the 3rd.
- 65—August 17, 1914. Venice to San Pedro. To prepare the launch for government work.
- 66—August 21, 1914. San Pedro to Venice. Marking albacore
- 67—August 26, 1914. From Venice to Point Dume and return. Marking albacore.
- 68—August 31, 1914. Venice to Wilmington. Launch repairs
- 69—September 5, 1914. San Pedro to Avalon.
- 70—September 6, 1914. Avalon, Catalina Island to Venice.
- 71—September 12, 1914. Venice to Point Dume and return, marking albacore.
- 72—September 15, 1914. Venice to Catalina Harbor.
- 73—September 16, 1914. Catalina Harbor to Santa Barbara Island and return.
- 74—September 17, 1914. Catalina Harbor to San Pedro.
- 75—October 6, 1914. San Pedro to Catalina Harbor.
- 76—October 7, 1914. Catalina Harbor to east end of Clemente Island and return.
- 77—October 8, 1914. Catalina Harbor to San Pedro and return.
- 78—October 9, 1914. Catalina Harbor toward west end of San Clemente Island and return.
- 79—October 10, 1914. Catalina Harbor to San Pedro.
- 80—October 12, 1914. San Pedro to Smugglers Cove, Santa Cruz Island.
- 81—October 13, 1914. Smugglers Cove, Santa Cruz Island, to east end Ana Capa Island and return.
- 82—October 14, 1914—Smuggler's Cove, Santa Cruz Island, to San Pedro.
- 83—October 15, 1914. San Pedro to Catalina Harbor.
- 84—October 16, 1914. Catalina Harbor to middle of Outer Santa Barbara Channel and return to San Pedro.
- 85—October 19, 1914. San Pedro to Catalina Harbor.

- 86—October 20, 1914. Catalina Harbor to Point Dume and Smuggler's Cove, Santa Cruz Island.
- 87—October 22, 1914. Smuggler's Cove, Santa Cruz Island, to San Pedro.
- 88—October 30, 1914. San Pedro to Venice to take up mooring.
- 89—October 31, 1914. Venice to San Pedro.
- 90—November 4, 1914. San Pedro to Catalina Harbor.
- 91—November 5, 1914. Catalina Harbor to middle of Outer Santa Barbara Channel and return.
- 92—November 7, 1914. Catalina Harbor to San Pedro.
- 93—November 10, 1914. San Pedro to San Diego. Left San Pedro 5:10 p. m. and arrived in San Diego Bay at 7 a. m. on the 11th.
- 94—November 12, 1914. San Diego to North Coronado Island and return.
- 95—November 13, 1914. San Diego to fishing banks 12 miles southwest off Point Loma and return.
- 96—November 14, 1914. Same as above.
- 97—November 18, 1914. Same as above.
- 98—November 20, 1914. Same as above, and then from the fishing banks went north to San Pedro, arriving in port at 2 a. m. the 21st.

THE SUMMER SESSION AT THE STATION

During the summer of 1914 a six weeks' session was held, beginning June 29 and ending August 7. The work with the Anton Dohrn extended over two weeks additional. Twenty-three students were enrolled in the courses offered, which consisted of General Zoology, two advanced courses in Zoology, and special investigation related to the work of the biological survey.

Each student was afforded an opportunity to join some of the expeditions of the launch and to get acquainted with the shore fauna of the adjacent beaches. The series of living animals in the glass tanks of the aquarium afforded opportunity to observe the life-habits of a wide range of marine animals not readily seen elsewhere.

The group of students present at the summer session find the atmosphere of investigation and exploration about them conducive to a high degree of efficiency and pleasure in their work. A course of general lectures on Marine Biology, on Evolution, and on the Albacore industry, were given during the session. The summer session for 1915 will include a larger number of these general lectures than have been given before.

A new laboratory and office was generously provided for the advanced students by the Abbot Kinney Company.

NOTES OF GENERAL BIOLOGICAL INTEREST

The Birth of the Young of the California Sea Lion, *Zalophus californianus*, Lesson, in captivity.

A pair of California sea lions, *Zalophus Californianus* Lesson, is kept in the large pool of the aquarium of the station. The size of the pool is about twenty-six by twelve feet and ten feet deep. At the north end there is constructed a ledge about nine feet from the bottom, usually about five feet above the surface of the water. On this ledge the seals rest when not in the water.

In this environment the female gave birth to young, June 10, 1914. No provision had been made for any special care of the young or mother, as the attendant was unaware that the female would bear young. Death of the young seal occurred almost immediately. The specimen was taken to a taxidermist, where it was mounted, and was placed in the museum of the aquarium.

From the mounted specimen the following data has been taken:

Total length to end of tail.....	28 $\frac{1}{4}$ inches
Tail	13 $\frac{1}{4}$ inches
From tip to tip of front flippers (as mounted)	15 inches
Length of hind flippers.....	7 inches

The general color is gray, which shades into a very dark color on the flippers. The color of the tail is much lighter

than the body, resembling somewhat the tawny yellow of the body of the adult.

A Herd of Elephant Seals, *Macrorhinus angustirostris*, Gill

In an exhibit on the pier near the aquarium is kept a herd of young elephant seals. They were captured by Capt. Chas. Davis off the coast of Lower California at Guadalupe Island and brought to Venice, where they were kept in a large tank which was supplied with water pumped from the canals.

They lived in excellent condition until last August, when the smaller pair died, leaving two pairs, the oldest of which is now about two years. No cause of the death of the seals could be discovered. The specimens were carefully examined and later preserved by the staff of the Los Angeles County Museum at Exposition Park. The largest bull is now somewhat over eight feet in length and weighs probably about eight hundred pounds.

The Occurrence of the Leatherback Turtle, *Sphargis coriacea*, (Linn)

During the summer of 1914 a specimen of this giant chelonian was brought to Venice. It was preserved by Col. Dan Duffy and kept on exhibition. It was reported to have been taken off the coast in the vicinity of San Juan Capistrano.

From the preserved specimen the following measurements were made:

Total length from tip of snout to end	
of tail	6 ft., 5 in.
Length of carapace.....	5 ft.
Width of carapace.....	2 ft., 10 in.
Width of front flippers.....	9½ in.
Stretch of front flippers from tip to tip..	7 ft.
Circumference of head.....	2 ft., 6½ in.

The Occurrence of Phosphorescent Organisms at the Beaches During the Summer of 1914

An unusual number of phosphorescent protozoa was found in the water at Venice and adjacent beaches during July and August. The color of the water by day was a deep reddish brown with streaks here and there of water apparently free from organisms. For a short time the amount of dead organic

matter was sufficient to produce a very noticeable odor in the aquarium. Some of the animals in the tanks died from the impurity of the water. Samples were taken at intervals during the summer session and preserved for identification. A report on the species found with notes on their distribution will be published at some later time.

INVESTIGATION IN PROGRESS

The following lines of investigation have recently been undertaken:

1. Dr. Samuel Rittenhouse has begun an investigation of the wood destroying animals found in the Santa Monica Bay region.

2. The department of Chemistry has undertaken the investigation of some of the chemical aspects of the marine algae with reference to the extraction and utilization of the salts entering into their composition.

3. An Ecological study of the fauna of Point Fermin. Beryl Rapp.

4. The oyster problem of Southern California. Ethel M. Palmer.

Progress in investigations continued from previous year:

5. The sewage contamination of the waters of the coast adjacent to Los Angeles has been studied by Professor L. J. Stabler and E. A. Just. They have determined the free oxygen content of the water as a factor indicating the degree of contamination. These studies were made on the water in Los Angeles harbor, Hyperion (the outfall of the Los Angeles sewer), at Venice, and Santa Monica. Samples were taken from the open sea five miles off shore as a standard of comparison.

6. The study of the relation of the bacteria in water contaminated with sewage to the free oxygen present in the water has been undertaken by Edwin Hadley of the Venice Union Polytechnic High School. Samples were taken from Santa Monica, Venice, Playa del Rey, Hyperion, and Los Angeles Harbor.

7. The study of the sting ray, *Urolophus halleri*, by Professor A. B. Ulrey, has been continued. During the past three years over two hundred embryos have been taken from the uterus and preserved in suitable fixing solutions. The stages showing the origin of the developing spine had eluded us for two seasons but our collections during the summer of 1913 provided not only these desired stages but many others as well. Serial sections of the spine region of twenty-five embryos of varying lengths have been made and some of the drawings completed.

8. The study of the *Brachyura* of the Santa Monica Bay region and the Anatomy and Life-habits of the Sand Crab, *Emerita*, has been continued by Percy S. Barnhart.

Papers recently published:

9. A general statement of the results of the study of the Abalone problem by Professor C. L. Edwards has been published in *Popular Science Monthly* for June, 1913.

10. The Conservation of the Marine Algae by Professor A. C. Life in the *Bulletin of the Southern California Academy of Sciences* for July, 1914.

EXPLANATION OF PLATES

The drawings were made by Elmer Higgins from the maps of the U. S. Coast and Geodetic Survey and the data derived from the log of the Anton Dohrn.

The trips of the Anton Dohrn indicated on Plate I are as follows: The small circles indicate the observing stations.

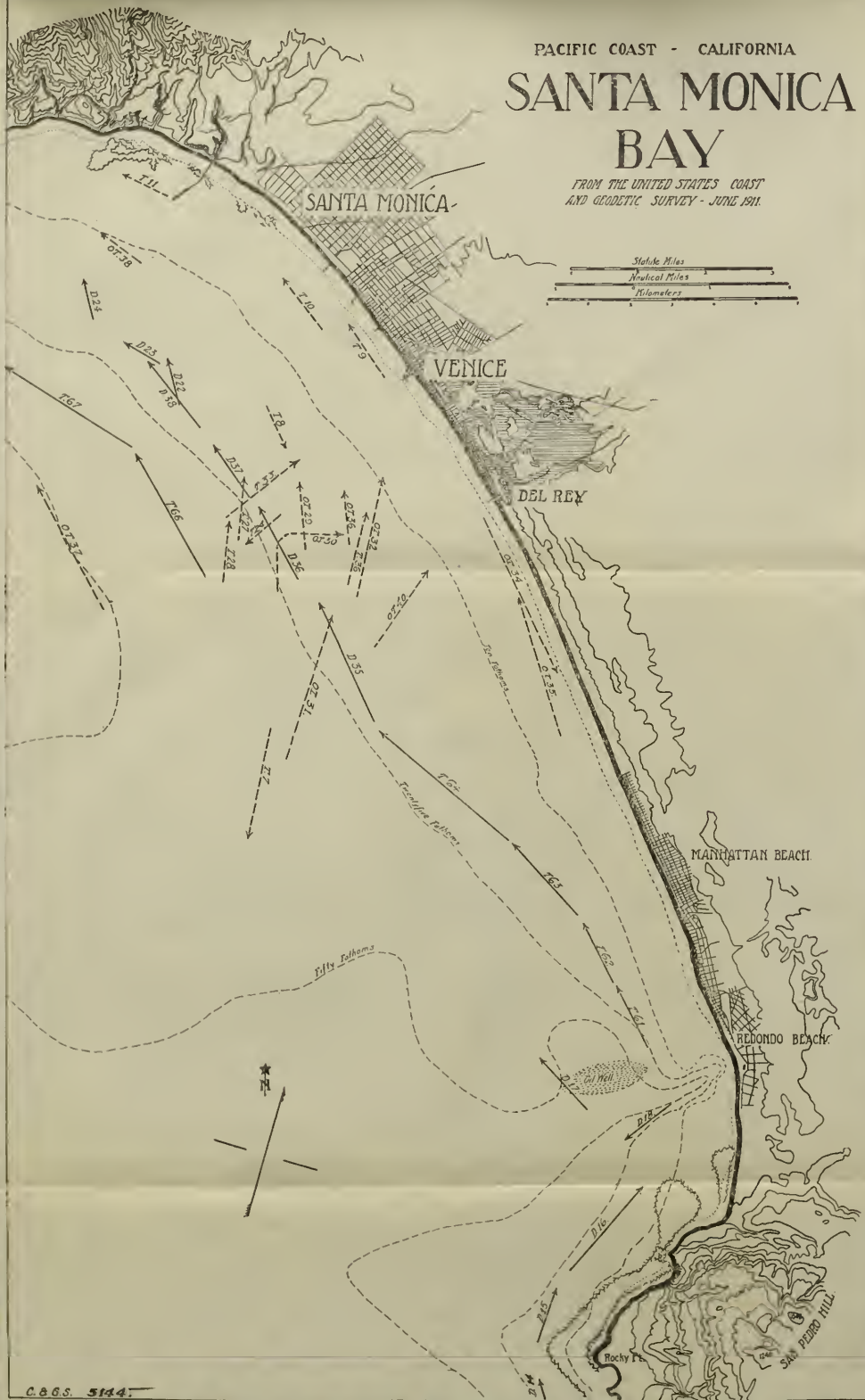
- | | |
|---------------------------|--------------------------|
| a. Trip of June 21, 1912 | h. Trip of Oct. 7, 1914 |
| b. Trip of Aug. 29, 1912 | i. Trip of Oct. 9, 1914 |
| c. Trip of Dec. 26, 1912 | j. Trip of Oct. 12, 1914 |
| d. Trip of Mar. 30, 1913 | k. Trip of Oct. 20, 1914 |
| e. Trip of June 13, 1913 | l. Trip of Nov. 10, 1914 |
| f. Trip of Aug. 18, 1913 | m. Trip of Nov. 12, 1914 |
| g. Trip of Sept. 16, 1914 | n. Trip of Nov. 13, 1914 |
| o. Trip of Nov. 20, 1914 | |

In Plates II and III, D indicates a station at which the dredge was used, T the trawl. The numeral following indicates the number of the dredge or trawl respectively.

PACIFIC COAST - CALIFORNIA

SANTA MONICA BAY

FROM THE UNITED STATES COAST
AND GEODETIC SURVEY - JUNE 1911.



C.B.G.S. 5144.

LOS ANGELES HARBOR AND VICINITY

FROM THE UNITED STATES COAST
AND GEODETIC SURVEY - JUNE 1911





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